

**DETERMINATION OF PHENOL IN WASTEWATER SAMPLE BY  
USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY  
(HPLC)**

**NURUL KUDSIAH BINTI HJ KATEMON**

**Final Year Project Report Submitted in  
Partial Fulfilment of the Requirements for the  
Degree of Bachelor of Science (Hons.) Chemistry  
In the Faculty of Applied Sciences  
Universiti Teknologi MARA**

**JULY 2017**

This Final Year Project Report entitled “**Determination of Phenol in Wastewater Sample by using High Performance Liquid Chromatography (HPLC)**” was submitted by Nurul Kudsiah Katemon, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences, and was approved by

---

Nor Monica Ahmad  
Supervisor  
B.Sc (Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

---

Nurul Huda Abdul Halim  
Project Coordinator  
B.Sc (Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

---

Mazni Musa  
Head of Programme  
B.Sc(Hons.) Chemistry  
Faculty of Applied Sciences  
Universiti Teknologi MARA  
72000 Kuala Pilah  
Negeri Sembilan

Date: \_\_\_\_\_

## TABLE OF CONTENTS

	Page
<b>ACKNOWLEDGEMENTS</b>	iii
<b>TABLE OF CONTENTS</b>	iv
<b>LIST OF TABLES</b>	vi
<b>LIST OF FIGURES</b>	vii
<b>LIST OF ABBREVIATIONS</b>	viii
<b>ABSTRACT</b>	x
<b>ABSTRAK</b>	xi
<b>CHAPTER 1 INTRODUCTION</b>	
1.1 Background	1
1.2 Problem statement	4
1.3 Significance of study	4
1.4 Objectives of study	5
<b>CHAPTER 2 LITERATURE REVIEW</b>	
2.1 Phenol	6
2.1.1 Sources of phenol	10
2.2 High Performance Liquid Chromatography (HPLC)	13
2.2.1 Types of chromatography column	15
2.2.2 Reversed phase chromatography	16
2.3 Solid Phase Extraction (SPE) for wastewater sample	17
2.4 Isocratic elution	19
<b>CHAPTER 3 METHODOLOGY</b>	
3.1 Chemical and apparatus	27
3.2 Preparation of standard stock solution	27
3.3 Preparation of sample (wastewater) using solid phase extraction (SPE)	28
3.4 Analysis using HPLC	30
3.5 Optimization of flow rate	31
<b>CHAPTER 4 RESULTS AND DISCUSSION</b>	
4.1 Effect of flowrate	33
4.2 Method of validation	35
4.2.1 Calibration curve of standard phenol	35
4.2.2 Limit of detection (LOD)	36
4.2.3 Limit of quantification (LOQ)	36
4.2.4 Precision and accuracy	37

4.3	Extraction of phenol from wastewater sample using SPE procedure	37
4.4	Detection of phenol in spiked wastewater sample	39
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATIONS</b>		
5.1	Conclusion	41
5.2	Recommendations	41
<b>CITED REFERENCES</b>		43
<b>APPENDICES</b>		48
<b><i>CURRICULUM VITAE</i></b>		59

## **ABSTRACT**

### **DETERMINATION OF PHENOL IN WASTEWATER SAMPLE BY USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC)**

The presence of phenol in water is risky to living organism as the toxicity effect causes the long-term exposure. In this research, the analysis was accomplished on a C18 column with UV-Vis detector (HPLC-UV) for determination of phenol in wastewater water while the solid phase extraction (SPE) is used as sample preparation technique. Five mL of load sample was used as the optimized variable in SPE while 0.75 mL/min was used as flow-rate on eluent in HPLC. The analytical method was validated according to the following parameter, which are precision, linear range, limit of detection (LOD), and limit of quantitation (LOQ). A good linear correlation coefficient with  $R^2 = 0.9991$  was observed over the range of 3.05 to 30.0  $\mu\text{g/mL}$ . The limit of detection was calculated to be 0.41  $\mu\text{g/mL}$ , while the limit of quantitation value of the validated method was measured to be 1.37  $\mu\text{g/mL}$ . Good recoveries were obtained in the range between 90 to 120%. In conclusion, the proposed method was found to be appropriate and accurate for the determination of phenol in wastewater by using HPLC.